CLAIMS

1. A sensor, comprising:

at least one substrate layer;

a plurality of individual sensor elements operatively arranged with respect to the substrate layer; and

a first and second conductive trace disposed on the substrate layer, each conductive trace electrically coupled to at least one sensor element and each conductive trace being spaced out from and extending at least partially around the at least one sensor element in a spiral-like pattern.

2. The sensor of claim 1, wherein the substrate layer is constructed and arranged to allow a sensor element to move relative to another sensor element.

3. The sensor of claim 1, further comprising a plurality of slits formed in the substrate layer at locations suitable to allow a sensor element to move relative to another sensor element.

4. The sensor of claim 3, wherein at least one of the plurality of slits is formed adjacent to a portion of the conductive trace which extends around a sensor element.

5. The sensor of claim 3, wherein at least a portion of the plurality of slits is formed along a nonlinear path.

6. The sensor of claim 3, wherein at least one of the plurality of slits formed in the substrate layer intersects a second slit formed in the substrate layer, thereby forming an intersecting slit.

7. The sensor of claim 6, wherein the intersecting slit is positioned between multiple sensor elements, and wherein one of the slits of the intersecting slit extends about at least a portion of one sensor element.

8. The sensor of claim 3, wherein at least one of the plurality of slits is adjacent to at least a portion of the conductive trace positioned between multiple sensor elements and at least a portion of the conductive trace which extends around a sensor element.

9. The sensor of claim 3, wherein a slit has first and second end points, wherein at least one end point is formed with a hole to relieve stress at the end point and thereby reduce the likelihood of the substrate layer from tearing at the end point.

10. The sensor of claim 3, wherein a slit has first and second end points, wherein at least one end point is formed in a hook-shape, such that if the substrate layer is subjected to relatively high stress at an end point, the substrate layer may tear, with an end of the tear terminating into the slit.

11. The sensor of claim 1, further comprising a plurality of cut-outs formed in the substrate layer at locations suitable to allow a sensor element to move relative to another sensor element.

12. The sensor of claim 11, wherein at least one cut-out formed in the substrate layer is positioned between multiple sensor elements and is generally diamond or kite shaped.

13. The sensor of claim 12, wherein the generally diamond or kite shaped cut-out includes a tail section extending about at least a portion of one sensor element.

14. The sensor of claim 1, wherein a sensor element comprises a pressure sensitive layer.

15. The sensor of claim 14, wherein the pressure sensitive layer comprises a conductive ink.

16. The sensor of claim 1, wherein the plurality of individual sensor elements is arranged on the substrate layer in an array of rows and columns.

17. The sensor of claim 16, wherein each sensor element is located at an intersection of a row and a column.

18. The sensor of claim 16, wherein the rows of sensor elements and the columns of sensor elements form an angle which is less than 90 degrees.

19. The sensor of claim 1, wherein the plurality of sensor elements defines a sensor plane, and wherein the substrate layer is constructed and arranged to allow a sensor to move in a direction perpendicular to the sensor plane and in a direction parallel to the sensor plane, with movement in the direction parallel to the sensor plane being less than the movement in the direction perpendicular to the sensor plane.

20. The sensor of claim 1, wherein each conductive trace is coupled to a sensor element at more than one location on the sensor element and wherein each conductive trace extends in a partial spiral-like pattern around a respective sensor element.

21. The sensor of claim 1, wherein at least a plurality of sensor elements is configured to detect a force, in combination with an apparatus for the custom fitting of a wheelchair seat or seat cushion, wherein the apparatus comprises:

a platform to which the sensor is mounted; and

a controller communicating with the sensor, wherein the controller is adapted to receive data from the sensor and calculate a force at locations coincident with locations of individual sensor elements upon the sensor being subjected to a force.

22. The sensor of claim 1, wherein the substrate layer comprises a first substrate layer and a second substrate layer, wherein the plurality of individual sensor elements is disposed between the first and second substrate layers, and wherein the first conductive trace is disposed on the first substrate layer and the second conductive trace is disposed on the second substrate layer.

23. The sensor of claim 23, further comprising an insulating layer positioned between the first and second substrate layers.

24. The sensor of claim 1, wherein the first conductive trace comprises a plurality of first conductive traces disposed on the at least one substrate layer, wherein a first one of the conductive traces extends at least partially around one of the plurality of individual sensor elements in a first spiral-like pattern and in a first direction, and wherein a second one of the first conductive traces extends at least partially around another one of the plurality of individual sensor elements in a second spiral-like pattern and in a second direction, wherein the first and second directions are substantially opposite each other.

25. The sensor of claim 24, wherein:

the plurality of individual sensor elements comprises a first plurality of individual sensor elements arranged in a first row and a second plurality of individual sensor elements arranged in a second row,

the first one of the first conductive traces is electrically coupled to and extends in a counter-clockwise direction at least partially around a first one of the first plurality of individual sensor elements in the first row, then extends in a clockwise direction at least partially around the first one of the first plurality of individual sensor elements in the first row, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the first plurality of individual sensor elements in the first row, then extends in a clockwise direction at least partially around the second one of the first plurality of individual sensor elements in the first row; and

the second of the first conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the second plurality of individual sensor elements in the second row, then extends in a counter-clockwise direction at least partially around the first one of the second plurality of individual sensor elements in the second row, then is electrically coupled to and extends in a clockwise direction at least partially around a second one of the second plurality of individual sensor elements in the second row, then extends in a counter-clockwise direction at least partially around the second one of the second plurality of individual sensor elements in the second row.

26. The sensor of claim 1 or 25, wherein the second conductive trace comprises a plurality of second conductive traces disposed on the at least one substrate

layer, wherein a first one of the second conductive traces extends at least partially around one of the plurality of individual sensor elements in a first spiral-like pattern and in a first direction, and wherein a second one of the second conductive traces extends at least partially around another one of the plurality of individual sensor elements in a second spiral-like pattern and in a second direction, wherein the first and second directions are substantially the same as each other.

27. The sensor of claim 26, wherein:

the plurality of individual sensor elements comprises a first plurality of individual sensor elements arranged in a first column and a second plurality of individual sensor elements arranged in a second column,

the first one of the second conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the first plurality of individual sensor elements in the first column, then extends in a counter-clockwise direction at least partially around the first one of the first plurality of individual sensor elements in the first column, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the first plurality of individual sensor elements in the first column, then extends in a clockwise direction at least partially around the second one of the first plurality of individual sensor elements in the first column; and

the second of the second conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the second plurality of individual sensor elements in the second column, then extends in a counter-clockwise direction at least partially around the first one of the second plurality if individual sensor elements in the second column, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the second plurality of individual sensor elements in the second column, then extends in a clockwise direction at least partially around the second one of the second plurality of individual sensor elements in the second column.

28. A sensor, adapted to conform to the shape of a surface, comprising:

a substrate layer; and

a plurality of individual sensor elements, for measuring a desired parameter, the plurality of sensor elements defining a sensor plane, the sensor elements are arranged with respect to the substrate layer in a manner that allows each sensor element to move in a direction perpendicular to the sensor plane and substantially independent of an adjacent sensor element moving in a direction perpendicular to the sensor plane.

29. The sensor of claim 28, wherein the substrate layer is formed of a thin, flexible material and is constructed and arranged to allow a sensor element to move relative to another sensor element.

30. The sensor of claim 28, further comprising a plurality of slits formed in the substrate layer at locations suitable to allow a sensor element to move relative to another sensor element.

31. The sensor of claim 30, wherein each of the plurality of slits are formed along a nonlinear path.

32. The sensor of claim 30, wherein at least one of the plurality of slits formed in the substrate layer intersects a second slit formed in the substrate, thereby forming an intersecting slit.

33. The sensor of claim 32, wherein the intersecting slit is positioned between multiple sensor elements, and wherein one of the slits of the intersecting slit extends about at least a portion of one sensor element.

34. The sensor of claim 30, wherein a slit has first and second end points, wherein at least one end point is formed with a hole to relieve stress at the end point and thereby reduce the likelihood of the substrate layer from tearing at the end point.

35. The sensor of claim 30, wherein a slit has first and second end points, wherein at least one end point is formed in a hook-shape, such that if the substrate layer is subjected to relatively high stress at the end point, the substrate layer may tear, with an end of the tear terminating into the slit.

36. The sensor of claim 28, wherein the plurality of sensor elements is arranged on a substrate layer, wherein the substrate layer comprises a plurality of cut-outs at locations suitable to allow a sensor element to move relative to another sensor element.

37. The sensor of claim 36, wherein at least one cut-out formed in the substrate layer is positioned between multiple sensor elements and is generally diamond or kite shaped.

38. The sensor of claim 37, wherein the generally diamond or kite shaped cut-out includes a tail section extending about at least a portion of one sensor element.

39. The sensor of claim 28, wherein at least one sensor element comprises a pressure sensitive layer.

40. The sensor of claim 39, wherein the pressure sensitive layer comprises a conductive ink.

41. The sensor of claim 28, wherein the plurality of sensor elements is arranged on a substrate layer in an array of rows and columns.

42. The sensor of claim 41, wherein each sensor element is located at an intersection of a row and a column.

43. The sensor of claim 28, wherein at least a plurality of sensor elements is configured to detect a force, in combination with an apparatus for the custom fitting of a wheelchair seat or seat cushion, wherein the apparatus comprises:

a platform to which the sensor is mounted; and

a controller communicating with the sensor, wherein the controller is adapted to receive data from the sensor and calculate a force at locations coincident with locations of individual sensor elements of the sensor upon the sensor being subjected to a force.

44. The sensor of claim 30, wherein two slits are formed between multiple adjacent sensors, with the two slits together resembling an hour-glass shape.

45. The sensor of claim 28, further comprising a first conductive trace, wherein the first conductive trace comprises a plurality of first conductive traces disposed on the substrate layer, wherein a first one of the conductive traces extends at least partially around one of the plurality of individual sensor elements in a first spiral-like pattern and in a first direction, and wherein a second one of the first conductive traces extends at least partially around another one of the plurality of individual sensor elements in a second spiral-like pattern and in a second direction, wherein the first and second directions are substantially opposite each other.

46. The sensor of claim 45, wherein:

the plurality of individual sensor elements comprises a first plurality of individual sensor elements arranged in a first row and a second plurality of individual sensor elements arranged in a second row,

the first one of the first conductive traces is electrically coupled to and extends in a counter-clockwise direction at least partially around a first one of the first plurality of individual sensor elements in the first row, then extends in a clockwise direction at least partially around the first one of the first plurality of individual sensor elements in the first row, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the first plurality of individual sensor elements in the first row, then extends in a clockwise direction at least partially around the second one of the first plurality of individual sensor elements in the first row; and

the second of the first conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the second plurality of individual sensor elements in the second row, then extends in a counter-clockwise direction at least partially around the first one of the second plurality of individual sensor elements in the second row, then is electrically coupled to and extends in a clockwise direction at least partially around a second one of the second plurality of individual sensor elements in the second row, then extends in a counter-clockwise direction at least partially around the second one of the second plurality of individual sensor elements in the second row.

47. The sensor of claim 28 or 46, further comprising a second conductive trace, wherein the second conductive trace comprises a plurality of second conductive traces disposed on the substrate layer, wherein a first one of the second conductive traces extends at least partially around one of the plurality of individual sensor elements in a first spiral-like pattern and in a first direction, and wherein a second one of the second conductive traces extends at least partially around another one of the plurality of individual sensor elements in a second spiral-like pattern and in a second direction, wherein the first and second directions are substantially the same as each other.

48. The sensor of claim 47, wherein:

the plurality of individual sensor elements comprises a first plurality of individual sensor elements arranged in a first column and a second plurality of individual sensor elements arranged in a second column,

the first one of the second conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the first plurality of individual sensor elements in the first column, then extends in a counter-clockwise direction at least partially around the first one of the first plurality of individual sensor elements in the first column, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the first plurality of individual sensor elements in the first column, then extends in a clockwise direction at least partially around the second one of the first plurality of individual sensor elements in the first column; and

the second of the second conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the second plurality of individual sensor elements in the second column, then extends in a counter-clockwise direction at least partially around the first one of the second plurality if individual sensor elements in the second column, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the second plurality of individual sensor elements in the second column, then extends in a clockwise direction at least partially around the second one of the second plurality of individual sensor elements in the second column.

49. A sensor array, for measuring a desired parameter, comprising:

at least one substrate layer;

a plurality of individual sensor elements operatively arranged with respect to the substrate layer, defining a sensor plane;

a plurality of conductive traces connecting the sensor elements, wherein each sensor element is in direct electrical contact with at least one respective conductive trace; and

a plurality of slits formed in the substrate layer, wherein the slits are arranged between each adjacent sensor element, wherein the slits permit a sensor element to move perpendicular to the sensor plane.

50. The sensor of claim 49, wherein the substrate layer is constructed and arranged to allow a sensor element to move relative to another sensor element.

51. The sensor of claim 49, wherein each of the plurality of slits are formed along a nonlinear path.

52. The sensor of claim 49, wherein at least one of the plurality of slits formed in the substrate layer intersects a second slit formed in the substrate, thereby forming an intersecting slit.

53. The sensor of claim 52, wherein the intersecting slit is positioned between multiple sensor elements, and wherein one of the slits of the intersecting slit extends about at least a portion of one sensor element.

54. The sensor of claim 49, wherein a slit has first and second end points, wherein at least one end point is formed with a hole to relieve stress at the end point and thereby reduce the likelihood of the substrate layer from tearing at the end point.

55. The sensor of claim 49, wherein each slit has first and second end points, wherein an end point is formed in a hook-shape, such that if the substrate layer is subjected to relatively high stress at an end point, the substrate layer may tear, with an end of the tear terminating into the slit.

56. The sensor of claim 49, wherein at least one sensor comprises a pressure sensitive layer.

57. The sensor of claim 56, wherein the pressure sensitive layer comprises a conductive ink.

58. The sensor of claim 49, wherein the plurality of sensor elements is arranged on the substrate layer in an array of rows and columns.

59. The sensor of claim 58, wherein each sensor element is located at an intersection of a row and a column.

60. The sensor of claim 49, wherein at least a plurality of sensor elements is configured to detect a force, in combination with an apparatus for the custom fitting of a wheelchair seat or seat cushion, wherein the apparatus comprises:

a platform to which the sensor is mounted; and

a controller communicating with the sensor, wherein the controller is adapted to receive data from the sensor and calculate a force at locations coincident with locations of individual sensor elements upon the sensor being subjected to a force.

61. The sensor of claim 58, wherein the rows of sensor elements and the columns of sensor elements form an angle which is less than 90 degrees and wherein two slits are formed between multiple sensors, with the two slits together resembling an hour-glass shape.

62. The sensor of claim 49, wherein the substrate layer is formed of a thin, flexible material.

63. The sensor of claim 49, further comprising a first conductive trace, wherein the first conductive trace comprises a plurality of first conductive traces disposed on the at least one substrate layer, wherein a first one of the conductive traces extends at least partially around one of the plurality of individual sensor elements in a

first spiral-like pattern and in a first direction, and wherein a second one of the first conductive traces extends at least partially around another one of the plurality of individual sensor elements in a second spiral-like pattern and in a second direction, wherein the first and second directions are substantially opposite each other.

64. The sensor of claim 63, wherein:

the plurality of individual sensor elements comprises a first plurality of individual sensor elements arranged in a first row and a second plurality of individual sensor elements arranged in a second row,

the first one of the first conductive traces is electrically coupled to and extends in a counter-clockwise direction at least partially around a first one of the first plurality of individual sensor elements in the first row, then extends in a clockwise direction at least partially around the first one of the first plurality of individual sensor elements in the first row, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the first plurality of individual sensor elements in the first row, then extends in a clockwise direction at least partially around the second one of the first plurality of individual sensor elements in the first row; and

the second of the first conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the second plurality of individual sensor elements in the second row, then extends in a counter-clockwise direction at least partially around the first one of the second plurality of individual sensor elements in the second row, then is electrically coupled to and extends in a clockwise direction at least partially around a second one of the second plurality of individual sensor elements in the second row, then extends in a counter-clockwise direction at least partially around the second one of the second plurality of individual sensor elements in the second row.

65. The sensor of claim 49 or 64, further comprising a second conductive trace, wherein the second conductive trace comprises a plurality of second conductive traces disposed on the at least one substrate layer, wherein a first one of the second conductive traces extends at least partially around one of the plurality of individual sensor elements in a first spiral-like pattern and in a first direction, and wherein a second one of the second conductive traces extends at least partially around another one of the

plurality of individual sensor elements in a second spiral-like pattern and in a second direction, wherein the first and second directions are substantially the same as each other.

66. The sensor of claim 65, wherein:

the plurality of individual sensor elements comprises a first plurality of individual sensor elements arranged in a first column and a second plurality of individual sensor elements arranged in a second column,

the first one of the second conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the first plurality of individual sensor elements in the first column, then extends in a counter-clockwise direction at least partially around the first one of the first plurality of individual sensor elements in the first column, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the first plurality of individual sensor elements in the first column, then extends in a clockwise direction at least partially around the second one of the first plurality of individual sensor elements in the first column; and

the second of the second conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the second plurality of individual sensor elements in the second column, then extends in a counter-clockwise direction at least partially around the first one of the second plurality if individual sensor elements in the second column, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the second plurality of individual sensor elements in the second column, then extends in a clockwise direction at least partially around the second one of the second plurality of individual sensor elements in the second column.

67. A force sensor, for measuring a force applied to a surface, comprising:

first and second thin, flexible substrate layers, the layers arranged in facing relationship to each other;

a first plurality of conductive traces formed on the first substrate layer and a second plurality of conductive traces formed on the second substrate layer, with the first and the second conductive traces facing each other;

a plurality of individual force sensor elements disposed between the first and the second substrate layers, and electrically connected to the first and second conductive traces, the first and second conductive traces each having a portion that extends from and partially around the sensor element in a spiral-like pattern; and

a plurality of slits formed through the first and second substrate layers, wherein the slits permit the sensor elements to move, thereby allowing a sensor element to move relative to adjacent sensor elements.

68. The sensor of claim 67, wherein the plurality of sensor elements is arranged in an array of rows and columns.

69. The sensor of claim 68, wherein the rows of sensor elements and the columns of sensor elements form an angle which is less than 90 degrees and wherein two slits are formed between multiple sensors, with the two slits together resembling an hour-glass shape.

70. The sensor of claim 67, wherein each sensor element comprises a pressure sensitive ink.

71. The sensor of claim 67, wherein at least a plurality of sensor elements is configured to detect a force, in combination with an apparatus for the custom fitting of a wheelchair seat or seat cushion, wherein the apparatus comprises:

a platform to which the sensor is mounted; and

a controller communicating with the sensor, wherein the controller is adapted to receive data from the sensor and calculate a force at locations coincident with locations of individual sensor elements upon the sensor being subjected to a force.

72. The sensor of claim 67, wherein the first conductive traces comprises a plurality of first conductive traces disposed on the first substrate layer, wherein a first one of the conductive traces extends at least partially around one of the plurality of individual sensor elements in a first spiral-like pattern and in a first direction, and wherein a second one of the first conductive traces extends at least partially around another one of the plurality of individual sensor elements in a second spiral-like pattern

and in a second direction, wherein the first and second directions are substantially opposite each other.

73. The sensor of claim 72, wherein:

the plurality of individual sensor elements comprises a first plurality of individual sensor elements arranged in a first row and a second plurality of individual sensor elements arranged in a second row,

the first one of the first conductive traces is electrically coupled to and extends in a counter-clockwise direction at least partially around a first one of the first plurality of individual sensor elements in the first row, then extends in a clockwise direction at least partially around the first one of the first plurality of individual sensor elements in the first row, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the first plurality of individual sensor elements in the first row, then extends in a clockwise direction at least partially around the second one of the first plurality of individual sensor elements in the first row; and

the second of the first conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the second plurality of individual sensor elements in the second row, then extends in a counter-clockwise direction at least partially around the first one of the second plurality of individual sensor elements in the second row, then is electrically coupled to and extends in a clockwise direction at least partially around a second one of the second plurality of individual sensor elements in the second row, then extends in a counter-clockwise direction at least partially around the second one of the second plurality of individual sensor elements in the second row.

74. The sensor of claim 67 or 73, wherein the second conductive traces comprises a plurality of second conductive traces disposed on the second substrate layer, wherein a first one of the second conductive traces extends at least partially around one of the plurality of individual sensor elements in a first spiral-like pattern and in a first direction, and wherein a second one of the second conductive traces extends at least partially around another one of the plurality of individual sensor elements in a second spiral-like pattern and in a second direction, wherein the first and second directions are substantially the same as each other.

75. The sensor of claim 74, wherein:

the plurality of individual sensor elements comprises a first plurality of individual sensor elements arranged in a first column and a second plurality of individual sensor elements arranged in a second column,

the first one of the second conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the first plurality of individual sensor elements in the first column, then extends in a counter-clockwise direction at least partially around the first one of the first plurality of individual sensor elements in the first column, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the first plurality of individual sensor elements in the first column, then extends in a clockwise direction at least partially around the second one of the first plurality of individual sensor elements in the first column; and

the second of the second conductive traces is electrically coupled to and extends in a clockwise direction at least partially around a first one of the second plurality of individual sensor elements in the second column, then extends in a counter-clockwise direction at least partially around the first one of the second plurality if individual sensor elements in the second column, then is electrically coupled to and extends in a counter-clockwise direction at least partially around a second one of the second plurality of individual sensor elements in the second column, then extends in a clockwise direction at least partially around the second one of the second plurality of individual sensor elements in the second column.